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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the connection release approach of the case and mounting components in an electronic instrument, the connection structure of a case and mounting components, and an electronic instrument.

[0002]

[Description of the Prior Art] As everyone knows, as a mechanical connection method of the case of an electronic instrument, and mounting components, it \*\*\*\*s and there are a caulking, a screw, etc. In order to cancel connection between a case and mounting components by these, the reverse action of an assembly sequence and destruction of a connection are required. For example, the actuation or the partial destruction which uses a special tool for discharge of connection with a screw thread on the revolution actuation by the screwdriver and a caulking, and a screw, and loosens a connection is needed.

[0003] The snap fitting is known as a mechanical connection method which avoids these complicated actuation. Drawing 7 R> 7 (a) is an example of the structure of the snap fitting which connects a case 1 and the mounting components 2. Here, when the claw part 3 of the couple prepared in the mounting components 2 side fits in to the hole 4 prepared in the case 1, connection between a case 1 and the mounting components 2 is made. The diameter of a claw part 3 is made to reduce like drawing 7 (b), and in order to cancel connection with the case 1 and the mounting components 2 which were connected by such snap fitting, from this condition as shown in (c), using a hand or a tool, a case 1 is further pulled apart from the mounting components 2. In such simple actuation, the connection release of a case 1 and the mounting components 2 becomes possible in the inside of a short time.

[0004]

[Problem(s) to be Solved by the Invention] However, also in such a snap fitting, the actuation whose operator removes the lock of a claw part by the hand or the tool is surely required at the time of discharge of connection. Therefore, contact is surely needed to a snap fitting, and unless it uses it also by the tool of dedication, two or more connections cannot be canceled simultaneously, either. Moreover, an effort is also taken to discover the location of a snap fitting. Thus, by the conventional approach, discharge of connection took time amount and time and effort, and there was a trouble of making difficult judgment by decomposition, abolition and recycle, and reuse of a product.

[0005] In view of such a situation, in this invention, two or more connections can be canceled in a short time, and let it be a technical problem to offer the discharge approach, the connection structure, and the electronic instrument of the case of an electronic instrument and mounting components which can easy-ize disassembly of a product, recycle, and reuse by this.

[0006]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, the following means were adopted in this invention. That is, in the electronic instrument with which components were mounted in the case by the mechanical connecting means, by giving and heating energy from the exterior to the mechanical connecting means of said case and mounting components, the connection release approach of the case of an electronic instrument according to claim 1 and mounting components is made to transform said connecting means, and is characterized by making

discharge actuation of mechanical connection perform by this.

[0007] Discharge actuation can be made to perform simultaneously to two or more connecting means in this invention, without touching a connecting means.

[0008] The connection release approach of the case of an electronic instrument according to claim 2 and mounting components is the connection release approach of the case of an electronic instrument according to claim 1, and mounting components, and is characterized by heating said connecting means to said predetermined temperature using the shape memory ingredient with which the configuration turns into a predetermined configuration in predetermined temperature at said a part of connecting means [ at least ].

[0009] In this invention, discharge actuation of a connecting means is certainly realizable in predetermined temperature.

[0010] The connection release approach of the case of an electronic instrument according to claim 3, and mounting components Are the connection release approach of the case of electronic equipment according to claim 2, and mounting components, and said two or more connecting means are received. It is characterized by adjusting the temperature of a connecting means and performing selectively mechanical connection release actuation with said case and mounting components by controlling the magnitude of said energy given from the exterior, using selectively said shape memory ingredient which has the property of said different predetermined temperature.

[0011] In this invention, desired mounting components can be selectively removed from a case.

[0012] The connection structure of the case of an electronic instrument according to claim 4, and mounting components It considers as the configuration with which the first engagement section prepared in said case and the second engagement section prepared in said mounting component engage mutually. either [ at least ] the engagement section of these first or the second engagement section is formed with the shape memory ingredient which deforms into a predetermined configuration in predetermined temperature -- having -- in addition -- and in said predetermined temperature, it is characterized by considering as the configuration which deforms so that said engagement may be canceled.

[0013] These engagement can be canceled in this invention, without contacting the first and second engagement sections by realizing predetermined temperature.

[0014] The connection structure of the case of an electronic instrument according to claim 5, and mounting components Are the connection structure of the case of an electronic instrument according to claim 4, and mounting components, and one-side of the said first and second engagement sections is formed as a hole. It is characterized by being formed as a tubed claw part to which this another side fits into the interior of said hole, and forming said claw part so that the diameter may be reduced in said predetermined temperature.

[0015] In this invention, it is simple structure and first and second connection release of the engagement section can be performed.

[0016] An electronic instrument according to claim 6 has a case and the mounting components mounted in this case, and is characterized by using connection structure according to claim 4 or 5 as a mechanical connecting means of said case and mounting components.

[0017] In this invention, removal of mounting components and a case can be thoroughly performed to the inside of a short time, without doing breakage to these.

[0018]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained based on a drawing. Drawing 1 (a) is drawing showing the connection structure of the case 1 and the mounting components 2 in the electronic instrument which is the gestalt of operation of the first of this invention. In this connection structure, it has the composition that the claw part 3 of the couple fixed to the mounting components 2 fits in inside the hole 4 prepared in the case 1. Moreover, the claw part 3 of these couples is mutually connected by the shape memory alloy spring 5. This shape memory alloy spring 5 deforms in the direction which that overall length contracts in the shape recovery temperatures set as predetermined temperature (for example, 70 degrees C). If energy 6 is given from the exterior to this connection structure, the shape memory alloy spring 5 will start deformation in the configuration (direction which an overall length contracts) which made it remember beforehand that a temperature rise resulted in a lifting and predetermined temperature. As

JP, 2001-013750, 1 [DETAILED DESCRIPTION]

this shows (b), it deforms so that the claw part 3 of a couple may pay well mutually, and the diameter is reduced to radial [ of a hole 4 ], and engagement to a claw part 3 and a hole 4 is canceled. Thereby, a case 1 and the mounting components 2 can be removed easily.

[0019] Drawing 2 (a) is drawing showing the gestalt of operation of the second of this invention. In the gestalt of this operation, between claw part 3 comrades of the couple prepared in the mounting components 2 is mutually connected by the shape memory alloy flat spring 7. In this connection structure, if energy 6 is supplied from the exterior, a temperature rise will arise in the shape memory alloy flat spring 7, and deformation will be started in the configuration it was made to remember that resulted in the shape recovery temperatures set up as 70 degrees C. Here, it becomes possible to make it have remembered that a flat spring bends so that two claw parts 3 may be mutually paid well, to cancel engagement to a hole 4 and a claw part 3, and to remove the mounting components 2 from a case 1, as this shows (b).

[0020] Drawing 3 (a) is drawing showing the gestalt of operation of the third of this invention. Although the main configurations of the gestalt of this operation are the same as that of the gestalt of the first operation almost, the gestalt of this third operation differs from the gestalt of the first operation in the point that the coil spring 8 infixed between a case 1 and the mounting components 2 is formed in the perimeter of a claw part 3 in the state of compression. In such a configuration, if energy 6 is supplied from the outside, when a shape memory alloy spring deforms, as shown in (b), the claw part 3 of a couple will reduce the diameter to radial [ of a hole 4 ], and, thereby, engagement of a claw part 3 and a hole 4 will be canceled. Then, as shown in (c), the elastic strain energy of a coil spring 8 is released, the repulsive force of a coil spring 8 acts in the direction which a case 1 and the mounting components 2 estrange, and thereby, connection of a case 1 and the mounting components 2 is canceled automatically.

[0021] Drawing 4 (a) is drawing showing the gestalt of operation of the fourth of this invention. Although the main configurations of the gestalt of this operation are the same as that of the gestalt of implementation of the above second almost, the gestalt of this fourth operation differs from the gestalt of the second operation in the point that the coil spring 8 infixed between a case 1 and the mounting components 2 is formed in the perimeter of a claw part 3 in the state of compression. In such a configuration, if energy 6 is supplied from the outside, when a shape memory alloy flat spring deforms, as shown in (b), the claw part 3 of a couple will reduce the diameter to radial [ of a hole 4 ], and, thereby, engagement of a claw part 3 and a hole 4 will be canceled. Then, as shown in (c), the elastic strain energy of a coil spring 8 is released, the repulsive force of a coil spring 8 acts in the direction which a case 1 and the mounting components 2 estrange, and thereby, connection of a case 1 and the mounting components 2 is canceled automatically.

[0022] Drawing 5 (a) is drawing showing the gestalt of operation of the fifth of this invention. In the gestalt of this operation, the condition that the claw part 3 prepared in the mounting components 2 reduced the diameter to radial [ of a hole 4 ] is made into the initial state. While arranging a case 1 first so that a claw part 3 may be located in the interior of a hole 4 in order to connect such a claw part 3 and a hole 4, a claw part 3 is extended and fitting is carried out to a hole 4. And as shown in (b), between the claw parts 3 of a couple, a lock pin 9 is pushed in and this fixes the location of a claw part 3. The lock pin 9 is equipped with the shape memory alloy spring 5, and this shape memory alloy spring 5 is infixed between a lock pin 9 and the mounting components 2.

[0023] In such a condition, if energy 6 is given from the exterior, a temperature rise will arise for the shape memory alloy spring 5. And if it results in 70 degrees C set up as shape recovery temperatures, a lock pin 9 will work from a claw part 3 in the shifting direction according to the repulsive force of the spring which recovered the configuration. As the elastic energy of a claw part 3 will be released if a lock pin 9 shifts from a claw part 3, and shown in (c), a claw part 3 will be in the diameter reduction condition which is an initial state, engagement to a claw part 3 and a hole 4 is canceled by this, and it becomes possible to remove the mounting components 2 from a case 1.

[0024] Drawing 6 is drawing showing typically how to give the energy 6 in the gestalt of the fifth operation from the above-mentioned first. Thus, in order to give energy from the exterior to a connection, two or more connection structures of connecting the case 1 and the mounting components 2 which were contained in the chamber can be simultaneously made into a connection release condition by containing a case 1 and the mounting components 2 inside the temperature-

control chamber 11, and maintaining the internal temperature of the temperature-control chamber 11 at predetermined temperature (for example, 70 degrees C) like drawing 6.

[0025] Moreover, although engagement to a hole 4 will be canceled about the claw part 3 for which the shape memory alloy spring 5 was used when the internal temperature of the temperature-control chamber 11 is kept at 70 degrees C, supposing the shape recovery temperatures of the shape memory alloy spring 5 shown in drawing 6 in this case are 70 degrees C and the shape recovery temperatures of the shape memory alloy spring 10 are 90 degrees C, the engagement to a hole 4 is not canceled for the claw part 13 for which the shape memory alloy spring 10 was used. Therefore, although the mounting components 2 can be removed from a case 1, the mounting components 12 connected to the case 1 through the claw part 13 are made into a condition [connecting with a case 1 mechanically].

[0026] Then, whenever [chamber internal temperature] is raised, and if the shape memory alloy spring 10 causes a temperature rise and amounts to 90 degrees C, engagement to a hole 4 will be canceled also in a claw part 13, and it will become possible to remove from a case 1 also about the mounting components 12. Thus, by using the shape memory alloy springs 5 and 10 which have different shape recovery temperatures, one side of the claw parts 3 and 13 can be preceded, and it can release from a hole 4 selectively.

[0027] As explained above, the connection release approach of the case 1 and the mounting components 2 (12) in the electronic instrument of the gestalt of the above-mentioned implementation, and connection structure A claw part 3 (13) is made to deform and, thereby, discharge actuation of the mechanical connection between a case 1 and the mounting components 2 (12) is made to perform by given and heating energy 6 from the exterior to the claw part 3 (13) which is the mechanical connecting means of a case 1 and the mounting components 2 (12). Therefore, moreover, discharge actuation can be made to perform simultaneously to two or more connecting means, without completely touching to a claw part. without it discovers a connection or needs an operator's hand and tool unlike the former by this -- a short time -- easy -- discharge of connection -- it can carry out -- in addition -- and the judgment by decomposition and abolition of a product since a removal activity can be performed without doing breakage to mounting components or a case -- a short time -- easy -- it can carry out -- reuse and recycle -- insurance -- and it can perform efficiently.

[0028] Moreover, since the ingredient (shape memory alloy) with which that configuration turns into a predetermined configuration in predetermined temperature to a claw part 3 (13) in this case was used, connection release actuation can be easily performed only by holding an electronic instrument in the chamber which maintained the interior at predetermined temperature, and working efficiency is high.

[0029] And since the shape memory alloy springs 5 and 10 which have different shape recovery temperatures were used to the claw part 3 and the claw part 13, by controlling the magnitude (for example, whenever [temperature-control chamber 11 internal-temperature]) of the energy given from the exterior, the temperature of claw parts 3 and 13 can be adjusted, and engagement to the hole 4 in claw parts 3 and 13 can be canceled selectively. Therefore, a desired connection place can be canceled selectively and an efficient removal activity can be realized.

[0030] Furthermore, in the gestalt of the above-mentioned implementation, since these connection is canceled when a claw part 3 (13) reduces the diameter in predetermined temperature while considering as the configuration in which a claw part 3 (13) fits into a hole 4, connection release actuation can be made to be able to perform with the same simple structure as the conventional snap fitting etc., and cost lifting of a product can be controlled.

[0031] Moreover, since the electronic instrument in the gestalt of the above-mentioned implementation can remove the mounting components 2 (12) and a case 1 easily, without doing breakage for a short time, as compared with the former, it can contribute to the judgment abolition by the overhaul of a product, recycle of mounting components, reuse, etc. greatly, and can realize an eco-friendly product.

[0032] In addition, you may make it adopt other configurations in the gestalt of the above-mentioned implementation within limits which do not deviate from the meaning of this invention. For example, in the gestalt of the above-mentioned implementation, although the temperature-control chamber 11

is used as a means to give energy 6 from the exterior, it can replace with this and energy, such as an electromagnetic wave, can also be used. Since the temperature rise of a connection can be performed more in a short time when an electromagnetic wave is used, the advantage of which connection can be canceled is for a short time from the approach by the heating chamber.

[0033] Moreover, of course, electronic parts can be applied also to structural parts, such as a machine part and an optic, and do not stop at connection between a case and mounting components, but the connection release approach and structure in a gestalt of the above-mentioned implementation can also be used for the connection release between mounting components. Furthermore, as a product field, a household-electric-appliances article, OA equipment, and a computer machine are begun, and it can apply to the machinery in which the electronic instrument was carried.

[0034] [Effect of the Invention] The connection release approach of the case of the electronic instrument of this invention and mounting components and connection structure are made to transform \*\*\*\*\* , and, thereby, make discharge actuation of the mechanical connection between a case and mounting components perform by giving and heating energy from the exterior to the mechanical connecting means of a case and mounting components, as explained above. Therefore, moreover, discharge actuation can be made to perform simultaneously to two or more connecting means, without completely touching to a claw part without it discovers a connection or needs an operator's hand and tool unlike the former by this -- a short time -- easy -- discharge of connection -- it can carry out -- in addition -- and the judgment by decomposition and abolition of a product since a removal activity can be performed without doing breakage to mounting components or a case -- a short time -- easy -- it can carry out -- reuse and recycle -- insurance -- and it can perform efficiently.

[0035] Moreover, since the shape memory ingredient with which that configuration turns into a predetermined configuration in predetermined temperature to a connecting means (first and second engagement section) in this case was used, connection release actuation can be easily performed only by holding an electronic instrument in the chamber which maintained the interior at predetermined temperature, and working efficiency is high.

[0036] Furthermore, if the shape memory ingredient which has different predetermined temperature (shape recovery temperatures) is used to two or more connecting means, by controlling the magnitude of the energy given from the exterior, the temperature of a connecting means can be adjusted and a desired connecting means can be canceled selectively. Therefore, an efficient removal activity is realizable.

[0037] Moreover, if it is made to make the diameter of a claw part reduce in predetermined temperature as a concrete connecting means while making a hole carry out fitting of the claw part, connection release actuation is possible with the same simple structure as the conventional snap fitting etc., and cost lifting of a product can be controlled.

[0038] Moreover, since the electronic instrument using such connection release structure can remove mounting components and a case easily, without doing breakage for a short time, as compared with the former, it can contribute to the judgment abolition by the overhaul of a product, recycle of mounting components, reuse, etc. greatly, and can realize an eco-friendly product.

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CLAIMS

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[Claim(s)]

[Claim 1] The connection release approach of the case of an electronic instrument and mounting components which are characterized by making said connecting means transform and making discharge actuation of mechanical connection by this perform by giving and heating energy from the exterior to the mechanical connecting means of said case and mounting components in the electronic instrument with which components were mounted in the case by the mechanical connecting means.

[Claim 2] The connection release approach of the case of an electronic instrument and mounting components which are characterized by heating said connecting means to said predetermined temperature using the shape memory ingredient with which it is the connection release approach of the case of an electronic instrument according to claim 1, and mounting components, and the configuration turns into a predetermined configuration in predetermined temperature at said a part of connecting means [ at least ].

[Claim 3] the connection release approach of the case of an electronic instrument and the mounting components which be characterize by to adjust the temperature of a connecting means and to perform selectively mechanical connection release actuation with said case and mounting components by control the magnitude of said energy give from the exterior, use selectively said shape memory ingredient which have the property of said predetermined temperature which be the connection release approach of the case of electronic equipment according to claim 2, and mounting components, and be different to said two or more connecting means.

[Claim 4] The first engagement section which is the connection structure of the case and mounting components in an electronic instrument, and was prepared in said case, It considers as the configuration with which the second engagement section prepared in said mounting component engages mutually. Either [ at least ] the engagement section of these first or the second engagement section it forms with the shape memory ingredient which deforms into a predetermined configuration in predetermined temperature -- having -- in addition -- and the connection structure of the case of an electronic instrument and mounting components which are characterized by considering as the configuration which deforms in said predetermined temperature so that said engagement may be canceled.

[Claim 5] It is the connection structure of the case of an electronic instrument and mounting components which are characterized by being the connection structure of the case of an electronic instrument according to claim 4, and mounting components, forming one side of the said first and second engagement sections as a hole, being formed as a claw part to which this another side fits into the interior of said hole, and forming said claw part so that the diameter may be reduced to radial [ of said hole ] in said predetermined temperature.

[Claim 6] The electronic instrument characterized by having a case and the mounting components mounted in this case, and using connection structure according to claim 4 or 5 as a mechanical connecting means of said case and mounting components.

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